DOCKET NO: 250365US2

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF	:
DAVID MOTTIER, ET AL.	: EXAMINER: LAM, K. T.
SERIAL NO: 10/815,724	:
FILED: APRIL 2, 2004	: GROUP ART UNIT: 2611
FOR: METHOD FOR EFFICIENT EQUALIZATION IN A TELECOMMUNICATION SYSTEM INCLUDING AT LEAST ONE MOBILE TRANSCEIVER	:

APPEAL BRIEF

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

SIR:

Applicants appeal the outstanding Final Rejection of May 14, 2008, finally rejecting each of pending Claims 1, 3-7, and 9-12.

I. REAL PARTY IN INTEREST

The above-noted application is assigned to Mitsubishi Denki Kabushiki Kaisha, which is the real party in interest, having a place of business at Tokyo, Japan.

II. RELATED APPEALS AND INTERFERENCES

Applicant and Applicant's representative are not aware of any related appeals or interferences that will directly effect or be directly affected by or having a bearing on the Board's decision in the pending appeal.

III. STATUS OF CLAIMS

Claims 1, 3-7, and 9-12 are pending in this application and the rejection of each of Claims 1, 3-7, and 9-12 is being appealed.

Claims 2, 8, 13, and 14 were cancelled during prosecution of this application.

IV. STATUS OF AMENDMENTS

A Request for Reconsideration was filed subsequent to the Final Rejection dated May 14, 2008. Accordingly, all previously filed Amendments have been considered by the Examiner and are reflected in the attached claims.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Claim 1 is directed to a method for transmitting data in a telecommunication system that includes at least a first transceiver and a second transceiver linked together by means of at least one communication channel, at least one of the transceivers being mobile, the method comprising: (1) spreading said data over a plurality of components; and (2) an equalization step of multiplying each of the components resulting from the spreading step by a corresponding predetermined equalization value representative of communication conditions within the communication channel, wherein at least one predetermined equalization value is determined so as to account for a Doppler effect resulting from a movement of the mobile transceiver, which adversely affects the communication conditions within the communication channel, wherein each predetermined equalization value is calculated using an equation that includes a parameter representative of a noise level in said communication channel and an additional noise variance representative of said Doppler effect.

The method recited in Claim 1 is generally supported by page 2, lines 21-29. In particular, the claimed telecommunication system that includes at least a first transceiver and a second transceiver linked together by means of at least one communication channel is shown in Figure 1 (first transceiver TXi, second transceiver RX, communication channel Chi). The transceivers can be mobile as described on page 5, line 24-26 of the specification.

In particular, Claim 1 recites spreading said data over a plurality of components, which finds supports, e.g., in Figure 1 (spreading means DPLCT performs the function of spreading the data Di "over a plurality of components"). See page 6, lines 3-4.

Further, Claim 1 recites an equalization step of multiplying each of the components resulting from the spreading step by a corresponding predetermined equalization value representative of communication conditions within the communication channel, which finds support in Figure 1 (equalization means MW1,...MWM multiplies each corresponding signal ctj by a predetermined equalization value "representative of communication conditions within the communication channel Chi..."). See page 6, lines 8-12.

Further, Claim 1 recites that at least one predetermined equalization value is determined so as to account for a Doppler effect resulting from a movement of the mobile transceiver, which adversely affects the communication conditions within the communication channel, wherein each predetermined equalization value is calculated using an equation that includes a parameter representative of a noise level in said communication channel and an additional noise variance representative of said Doppler effect, which finds support, e.g., in column 7, line 22 to column 8, line 9 ("the predetermined equalization values Wi(j) will also be representative of a Doppler effect resulting from a movement of the mobile transceiver TXi and adversely affecting the communications conditions within the communication channel Chi."). See in particular the equations shown on page 8 of the specification, which show that the predetermined equalization values are determined by an equation that includes

a parameter representative of a noise level in said communication channel (σ^2) (see column 7, line 13) and an additional noise variance representative of said Doppler effect (σ_d^2). Two equations are shown on page 8, one for the SINR technique, and one for the MMSE technique.

Independent Claim 7 is directed to a telecommunication system including at least a first transceiver and a second transceiver linked together by means of at least one communication channel, at least one of the transceivers being mobile, the system comprising: (1) spreading means for spreading data to be transmitted through said communication channel over a plurality of components; and (2) equalization means for multiplying each of the components outputted by the spreading means by a corresponding predetermined equalization value representative of communication conditions within the communication channel, wherein at least one predetermined equalization value is determined so as to account for a Doppler effect resulting from a movement of the mobile transceiver, which adversely affects the communication conditions within the communication channel; and wherein each predetermined equalization value is determined based on a parameter representative of a noise level in said communication channel and an additional noise variance representative of said Doppler effect.

The system recited in Claim 7 is generally supported by page 4, lines 16-28. In particular, the claimed telecommunication system including at least a first transceiver and a second transceiver linked together by means of at least one communication channel is shown in Figure 1 (first transceiver TXi, second transceiver RX, communication channel Chi). The transceivers can be mobile as described on page 5, line 24-26 of the specification.

In particular, Claim 7 recites spreading means for spreading data to be transmitted through said communication channel over a plurality of components, which finds supports,

e.g., in Figure 1 (spreading means DPLCT performs the function of spreading the data Di "over a plurality of components"). See page 6, lines 3-4.

Further, Claim 7 recites equalization means for multiplying each of the components outputted by the spreading means by a corresponding predetermined equalization value representative of communication conditions within the communication channel, which finds support in Figure 1 (equalization means MW1,...MWM multiplies each corresponding signal ctj by a predetermined equalization value "representative of communication conditions within the communication channel Chi..."). See page 6, lines 8-12.

Further, Claim 7 recites that at least one predetermined equalization value is determined so as to account for a Doppler effect resulting from a movement of the mobile transceiver, which adversely affects the communication conditions within the communication channel; and wherein each predetermined equalization value is determined based on a parameter representative of a noise level in said communication channel and an additional noise variance representative of said Doppler effect, which finds support, e.g., in column 7, line 22 to column 8, line 9 ("the predetermined equalization values Wi(j) will also be representative of a Doppler effect resulting from a movement of the mobile transceiver TXi and adversely affecting the communications conditions within the communication channel Chi."). See in particular the equations shown on page 8 of the specification, which show that the predetermined equalization values are determined by an equation that includes a parameter representative of a noise level in said communication channel (σ^2) (see column 7, line 13) and an additional noise variance representative of said Doppler effect (σ_d^2). Two equations are shown on page 8, one for the SINR technique, and one for the MMSE technique.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The ground of rejection being appealed is whether the teachings of U.S. Patent Application Publication No. 2003/0123384 to Agee (hereinafter "the '384 application") in view of U.S. Patent No. 7,286,593 to Banerjee (hereinafter "the '593 patent"), further in view of U.S. Patent Application Publication No. 2005/0018641 to Zhao et al. (hereinafter "the '641 application") render obvious the subject matter of Claims 1, 3-7, and 9-12 under 35 U.S.C. § 103(a).

VII. ARGUMENT

Claims 1, 3-7, and 9-12

Claim 1 is directed to a method for transmitting data in a telecommunication system that includes at least a first transceiver and a second transceiver linked together by means of at least one communication channel, at least one of the transceivers being mobile, the method comprising: (1) spreading said data over a plurality of components; and (2) an equalization step of multiplying each of the components resulting from the spreading step by a corresponding predetermined equalization value representative of communication conditions within the communication channel, wherein at least one predetermined equalization value is determined so as to account for a Doppler effect resulting from a movement of the mobile transceiver, which adversely affects the communication conditions within the communication channel, wherein each predetermined equalization value is calculated using an equation that includes a parameter representative of a noise level in the communication channel and an additional noise variance representative of the Doppler effect.

Applicants respectfully submit that a *prima facie* case of obviousness has not been established and the rejection of Claim 1 (and all similarly rejected dependent claims) should be withdrawn.

Regarding the rejection of Claim 1 under 35 U.S.C. §103(a), the Office Action asserts that the '384 application discloses everything in Claim 1 with the exception of "detailed disclosure of the equalization equations,"[1] and relies on the '593 patent and the '641 application to remedy that deficiency. Applicants note that the outstanding Office Action relies on the newly cited '641 application in its rejection of Claim 1. However, Applicants note that page 4 of <u>the outstanding Office Action does not indicate what the deficiencies are in the teachings of the '384 application and the '593 patent with respect to the limitations recited in Claim 1</u>. Thus, it is not clear to Applicants what limitation the '641 application is being relied upon as disclosing. Applicants request that, in any future Office Action, the Office Action clearly indicate what each reference is relied upon to teach. Further, as stated in previous remarks, Applicants respectfully request that the Examiner identify the additional noise variance representative of the Doppler effect, as recited in Claim 1. In the present rejection, the Office Action refers to <u>four</u> different equations in the '641 application, but does not specifically identify how the '641 parameters are read on the parameters recited in Claim 1. Thus, it is unclear to Applicants exactly which parameters disclosed by the '641 application the Examiner is reading on the claimed parameters.

The '384 application is directed to a stacked-carrier spread spectrum communication system that is based on frequency domain spreading in which a time-domain representation of a base-band signal is multiplied by a set of stacked complex sinusoidal carrier waves. As shown in Figure 9, the '384 application discloses a delay Doppler equalization unit 274 and a delay Doppler estimation unit 273. However, as admitted in the outstanding Office Action, the '384 application fails to disclose <u>predetermined equalization values, wherein **each** predetermined equalization value is calculated using an equation that includes a parameter representative of a noise level in the communication channel and an additional noise variance</u>

[1] See page 3 of the outstanding Office Action.

representative of the Doppler effect, as recited in Claim 1. Moreover, Applicants note that the '384 patent fails to explicitly disclose multiplying components resulting from a spreading step by corresponding predetermined equalization values, as required by Claim 1. Rather, the '384 application discloses a "delay, Doppler pre-emphasis unit" 280, but does not provide details of how this unit operates. For example, the '384 application does not disclose that multiplication of components by predetermined equalization values is performed by the "delay, Doppler pre-emphasis unit" 280. In this regard, Applicants note that page 3 of the outstanding Office Action implies that the operation of the "delay, Doppler pre-emphasis unit" 280 is functionally equivalent to the claimed multiplication of spread components by equalization values, but does not offer any evidence as to why they are equivalent. As discussed above, the '384 application does not disclose how the "delay, Doppler pre-emphasis unit" 280 operates and there is no disclosure of multiplication of components by equalization values, as required by Claim 1.

The '593 patent is directed to a channel estimator for determining channel weighting coefficients for a finger of a RAKE receiver. In particular, as shown in Figure 3, the '593 patent discloses that the weighting coefficients b(n) in each of the fingers of the RAKE receiver 300 are calculated by a channel estimation filter that uses the pilot channel signals transmitted by base stations 101, 102, and 103, and that optimizes the weighting coefficients b(n) over a range of Doppler frequencies that use the average MMSE criterion.[2] In particular, the '593 patent discloses that the channel estimator 400 shown in Figure 4, which includes filters 440a and 440b, produces outputs H1 and H2, which are used as the weighting coefficients i.e., b(n), for the fingers of the RAKE receiver. Further, the '593 patent discloses that, regarding the channel estimation filter, the transfer function of the filter in the frequency domain is determined as shown in column 8 of the '593 patent, wherein a probability density

[2] '593 patent, column 6, lines 21-28.

function for the Doppler frequency must be assumed. In particular, the '593 patent discloses that the transfer function of the filter is determined by averaging over the possible range of Doppler frequencies using the assumed probability density function. By so doing, the '593 patent discloses that the '593 system has several advantages over the prior art systems that use MMSE channel estimation and require knowledge of signal-to-noise ratios and Doppler frequencies. In particular, the '593 patent discloses that "there is no need for a Doppler estimator or a per finger SIR estimator" and that "the filter structure does not change with changes in ...Doppler and SIR."[3] Thus, the '593 patent notes that "the present invention performs sub-optimally compared to the prior art at a particular Doppler value and SIR setting. However, the present invention gives the best performance for the ensemble average for all Doppler settings and performance simulations demonstrate acceptable performance at the entire range of expected Doppler frequencies."[4]

Thus, Applicants respectfully submit that the '593 patent **teaches away** from using an additional noise variance representing the Doppler affect, as required by Claim 1. In particular, Applicants note that the equation shown in line 20 of column 8 in the '593 patent regarding the transfer function of the filter merely includes a variance value for the noise estimation, but does not disclose a variance representative of the Doppler affect. Rather, as discussed above, the '593 patent averages over all Doppler frequencies using a model probability density function, and therefore does not have a need to model the Doppler effect using an additional noise variance representative of the Doppler affect, as required by Claim 1. In summary, Applicants respectfully submit that the '593 patent fails to disclose that each predetermined equalization value is calculated using an equation that includes a parameter representative of a noise level in the communication channel and an additional noise variance representative of the Doppler effect, as recited in Claim 1. Moreover, Applicants respectfully

[3] '593 Patent, column 12, lines 39-43. Emphasis added.
[4] '593 Patent, column 12, lines 48-53.

submit that one of ordinary skill in the art would not have been motivated to modify the teachings of the '384 application with those of the '593 patent, since the '593 patent teaches away from having an additional noise variance representing a Doppler effect. Moreover, Applicants note that the '593 patent is directed to a RAKE receiver, while the '384 application relates to an encoding process at a transmitter. In this regard, Applicants note that Claim 1 is directed to a method for transmitting data and recites steps performed at the transmitter.

The '641 application is directed to a method and apparatus for adjusting an average interval of channel estimation dynamically based on Doppler shift. The method comprises the steps of estimating Doppler shift by using a level crossing rate (LCR) according to different moving speeds of mobile terminals; determining the optimal average interval of channel estimation based on the relationship between the existing Doppler shift and the optimal average interval of channel estimation; dynamically adjusting the average interval of channel estimation according to the determined optimal average interval of channel estimation to make the coherent receiver obtain the optimal estimation performance at different moving speeds. As shown in Figure 1, the '641 application discloses a system in which the number of level crossings (with positive slope) at a fixed interval T is calculated as the number of crossings M/T. This value is used as an estimate of the Doppler shift.[5] See also equation 6, which provides an estimate of the Doppler shift f_d for the ith finger of the RAKE receiver, which is again based on the number of crosses of the average level. Further, as shown in equation 7, the '641 application discloses a formula for the optimal average interval of channel estimation P. However, Applicants note that equation 7 does not determine equalization values that are used to multiply each of the components resulting from a spreading step, as required by Claim 1. Rather, equation 7 produces an optimal average

[5] See '641 application, paragraph [0014].

interval of channel estimation, which is a window length. Moreover, Applicants note that the Doppler shift estimation disclosed by the '641 application is not a variance, as required by Claim 1. In this regard, Applicants respectfully submit that the term variance is a well known term in statistics and would have a particular meaning to one of ordinary skill in the art. Further, as discussed above, equations 4-7 disclosed by the '641 application are implemented in a receiver, and are not performed as part of spreading and equalization in a transmitter, as required by Claim 1.

Thus, no matter how the teachings of the '384 application, the '593 patent, and the '641 application are combined, the combination does not teach or suggest an equalization step of multiplying each of the components resulting from a spreading step by a corresponding predetermined equalization value, wherein each predetermined equalization value is calculated using an equation that includes a parameter representative of a noise level in the communication channel and an additional noise variance representative of the Doppler effect, as required by Claim 1. Accordingly, Applicants respectfully submit that a *prima facie* case of obviousness has not been established and that the rejection of Claim 1 (and all similarly rejected dependent claims) should be withdrawn.

Further, Applicants respectfully submit that one of ordinary skill in the art would not have been motivated to combine the teachings of the '384 application, the '593 patent, and the '641 application, as suggested by the outstanding Office Action. As discussed above, the '593 patent teaches away from using an additional noise variance representing a Doppler effect, and is thus not combinable with the teachings of the '384 application and the '641 application. As discussed above, the '593 patent discloses that "**there is no need for a Doppler estimator** or a per finger SIR estimator" and that "the filter structure does not change with changes in ... Doppler and SIR."[6] Thus, one of ordinary skill in the art would

[6] '593 Patent, column 12, lines 39-43. Emphasis added.

not have been motivated to combine the teachings of the '593 patent with those of the '384 and '641 application, which appear to require Doppler estimation, since the '593 patent explicitly discloses that Doppler estimation is not required. Moreover, it is unclear to Applicants how the cited references can be combined, since the '593 patent and the '641 application relate to RAKE receivers, while the '384 patent does not. For these additional reasons, Applicants respectfully submit that a *prima facie* case of obviousness has not been established and that the rejection of Claim 1 (and all similarly rejected dependent claims) should be withdrawn.

Independent Claim 7 recites limitations analogous to those recited in Claim 1. In particular, Claim 7 recites that each predetermined equalization value is determined based on a parameter representative of a noise level in the communication channel and an additional noise variance representative of the Doppler effect. Accordingly, for the reasons set forth above, Applicants respectfully submit that a *prima facie* case of obviousness has not been established and that the rejection of Claim 7 (and all similarly rejected dependent claims) should be withdrawn.

Further, Applicants note that Claim 3 clarifies that the additional noise variance representative of the Doppler effect <u>increases with an amount of time elapsed since the incoming signal has been received by the mobile transceiver</u>. In this regard, Applicants note that the Office Action relies on column 7, line 53 to column 8, line 49 as well as column 10, lines 1-63 in the '593 patent as disclosing this limitation. However, Applicants note that these sections in the '593 patent relate to the derivation of the disclosed filter, but do not disclose an additional noise variance representative of the Doppler effect, and <u>clearly do not disclose that the variance would increase with the amount of time elapsed since the incoming signal has been received by the mobile transceiver</u>, as recited in Claim 3. Moreover, Applicants note that in the most recent Office Action, the Examiner has additionally asserted

that the '641 application discloses the limitation recited in Claim 3 in paragraphs [0014]-[0022] and specifically in equation 1. However, Applicants note that equation 1 merely states that the Doppler shift can be estimated by counting the number of level crossings in a fixed interval T, and dividing that number by the fixed interval T. Applicants respectfully submit that this is unrelated to an additional noise variance representative of the Doppler effect that <u>increases with an amount of time elapsed since the incoming signal has been received by the mobile receiver</u>, as required by Claim 3. Even if the fixed interval T is somehow equated with the claimed amount of time elapsed since the incoming signal has been received by the mobile transceiver, if this value T is increased, the Doppler shift would decrease, not increase, as required by Claim 3. Accordingly, Applicants respectfully submit that a *prima facie* case of obviousness has not been established and that the rejection of Claim 3 should be withdrawn.

Thus, it is respectfully submitted that independent Claims 1 and 7 (and all associated dependent claims) patentably define over any proper combination of the '384 application, the '593 patent, and the '641 application.

VIII. CONCLUSION

For the foregoing reasons, Applicant respectfully submits that each of Claims 1, 3-7, and 9-12 patentably distinguishes over the combination of teachings of the '384 application, the '593 patent, and the '641 application. Therefore, the outstanding rejections must be REVERSED.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.

Kurt M. Berger

Eckhard H. Kuesters
Attorney of Record
Registration No. 28,870

Kurt M. Berger, Ph.D.
Registration No. 51,461

Customer Number
22850

Tel: (703) 413-3000
Fax: (703) 413 -2220
(OSMMN 08/03)
EHK/KMB:smi

I:\ATTY\KMB\250'S\250365US\250365US.APPEAL.BRIEF.DOC

CLAIMS APPENDIX

1. (Rejected) A method for transmitting data in a telecommunication system that includes at least a first transceiver and a second transceiver linked together by means of at least one communication channel, at least one of the transceivers being mobile, the method comprising:

spreading said data over a plurality of components; and

an equalization step of multiplying each of the components resulting from the spreading step by a corresponding predetermined equalization value representative of communication conditions within the communication channel,

wherein at least one predetermined equalization value is determined so as to account for a Doppler effect resulting from a movement of the mobile transceiver, which adversely affects the communication conditions within the communication channel, wherein each predetermined equalization value is calculated using an equation that includes a parameter representative of a noise level in said communication channel and an additional noise variance representative of said Doppler effect.

2. (Canceled)

3. (Rejected) The method as claimed in claim 1, wherein the communication conditions within the communication channel are modeled by means of a study of the effects of said conditions on at least one incoming signal previously received by the mobile transceiver through said communication channel; and

the additional noise variance representative of said Doppler effect increases with an amount of time elapsed since said incoming signal has been received by the mobile transceiver.

4. (Rejected) The method as claimed in claim 1, wherein the communication conditions within the communication channel are modeled by means of a study of the effects of said conditions on at least one incoming signal previously received by the mobile transceiver through said communication channel; and

the additional noise variance representative of said Doppler effect is a constant variance whose value has been averaged over a time interval between two successive incoming signals.

5. (Rejected) The method as claimed in claim 1, wherein the equalization step is performed by the mobile transceiver on components of a signal to be transmitted by said mobile transceiver.

6. (Rejected) The method as claimed claim 1, wherein the equalization step is performed by the mobile transceiver on components of a signal received by said mobile transceiver.

7. (Rejected) A telecommunication system including at least a first transceiver and a second transceiver linked together by means of at least one communication channel, at least one of the transceivers being mobile, the system comprising:

spreading means for spreading data to be transmitted through said communication channel over a plurality of components; and

equalization means for multiplying each of the components outputted by the spreading means by a corresponding predetermined equalization value representative of communication conditions within the communication channel,

wherein at least one predetermined equalization value is determined so as to account for a Doppler effect resulting from a movement of the mobile transceiver, which adversely affects the communication conditions within the communication channel; and

wherein each predetermined equalization value is determined based on a parameter representative of a noise level in said communication channel and an additional noise variance representative of said Doppler effect.

8. (Canceled)

9. (Rejected) The telecommunication system as claimed in claim 7, wherein the communication conditions within the communication channel are modeled by means of a study of the effects of said conditions on at least one incoming signal previously received by the mobile transceiver through said communication channel; and

the additional noise variance representative of said Doppler effect increases with an amount of time elapsed since said incoming signal has been received by the mobile transceiver.

10. (Rejected) The telecommunication system as claimed in claim 7, wherein the communication conditions within the communication channel are modeled by means of a study of the effects of said conditions on at least one incoming signal previously received by the mobile transceiver through said communication channel; and

the additional noise variance representative of said Doppler effect is a constant variance whose value has been averaged over a time interval between two successive incoming signals.

11. (Rejected) A mobile transceiver to be included in a telecommunication system as claimed in claim 7, wherein the equalization means are arranged in the mobile transceiver upstream of a transmitting stage, and are configured to process components of a signal to be transmitted by said transmitting stage.

12. (Rejected) A mobile transceiver to be included in a telecommunication system as claimed in claim 7, wherein the equalization means are arranged in the mobile transceiver downstream of a receiving stage, and are configured to process components of a signal received by said receiving stage.

13-14. (Canceled)

EVIDENCE APPENDIX

None

RELATED PROCEEDING APPENDIX

None